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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/566,334	CHELLAPPA ET AL.	
	Examiner	Art Unit	
	MARIANNE L. PADGETT	1715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/14/2011, 2/5/11 & 12/31/10*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3,8-10,12,14-18,21-23,25-29,33-35,37-39,41,42 and 45-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,8-10,12,14-18,21-23,25-29,33-35,37-39,41,42 and 45-49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. A **Request for Continued Examination** under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/14/2011 has been entered.

As noted in the advisory reactions of 1/6/11 & 2/17/11 the amendments to the claims 112 first & second issues that were discussed in sections 2 & 3 of the action mailed 12/16/2010, while the amendment to the specification corrects the typographical error is noted in section 4 of that action.

With respect to the 35 U.S.C. **103(a)** rejection over **Chellappa et al**. (7,077,889 B2), the examiner notes that applicant's statement with respect common ownership on page 21 of their 2/5/2011 response is sufficient to remove this rejection.

The examiner reviewed [0090] in the original specification, which applicants cited as support for the amendment to claim 8 & 33 (bottom of page 11 in the 2/5/11 submission), but found no discussion of barrier layers or diffusion of either hydrogen or intermetallic therein. However, the examiner notes that [0092] discusses oxide barrier layers preventing contamination from stainless steel substrates, with discussion of intermetallic diffusion between stainless steel supports substrates & Pd/Ag coating being a problem, as it drastically reducing hydrogen permeation. The paragraph then teaches that prior to providing that coating, the supports are treated at 900°C in air to form an oxide layer to serve as a barrier against intermetallic diffusion. This discussion in [0092], may be reasonably considered to provide support for the amendments to the claims 8 & 33.

2. The **disclosure** is **objected** to because of the following informalities: in reviewing the specification for support for the limitations newly combined together in the independent claim 1, the examiner noted that [0024] indicates figure 2 is conventional, however Fig. 2 is not so labeled as prior art.

Similarly, [0041] indicates that figure 3 is commercially available, i.e. also indicating it should be labeled as prior art, but it's not.

Of more concerned that just labeling, [0033] ambiguously refers to "Figs 2-5" with respect to be published application to WO 002/086987, such that it is unclear whether figures 2-5 of the present application came from this PCT document (i.e. are all prior art), or if just the figures of this document that is not actually of record in this case, are being referred to, without intent to actually refer to applicant's own figures.

Appropriate correction is required.

The **drawings** are **objected** to because some of the drawings, at least Figures 2 & 3 are prior art & should be so labeled. Corrected drawing sheets in compliance with **37 CFR 1.121(d)** are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. **Claims 1, 3, 8-10, 12, 15-18, 21-23, 25-28 & 47-49** are rejected under 35 U.S.C. **112, first** paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In reviewing the original specification, the examiner finds that while original claim 13 had the language of "subjecting said leak-tight coating to thermal processing", it was dependent on original claim 1, whose substrate was generic & limitations were broader, plus the "leak-tight coating" while it could be the hydrogen separation membrane, it was not necessarily the hydrogen separation membrane; thus does not necessarily provide support for the current combination of limitations; which combination includes the substrate = porous metallic substrate, & the **timing** of the "and subjecting said coating to thermal processing" as inserted in the claim after the requirement of "forming a coating..., thereby forming said hydrogen separation membrane upon said substrate", appears to include subjecting the completely formed hydrogen separation membrane to any sort of thermal processing, and only ambiguously{depending on whether one considers the substrate + coating (which is required to provide permeance of hydrogen therethrough) to be the claimed membrane} thermal treating before the final forming of the hydrogen separation membrane. Original claim 14 & [0015] clearly require both the forming & thermal processing, successively repeated sets at these operations forming plural layers to be what forms the hydrogen separation membrane; thus do not support the present combination in its scope is presently written. [0060] discusses the process with respect to porous substrates, specifying various stainless steel supports, plus pretreatments thereof, also has teachings related to the sequential & repeated deposition, forming & thermal processing limitations, with a general statement referring to figure 5 & the sequence of process steps, which clearly indicate that all forming & thermal processing are completed before the forming of the hydrogen separation membrane is considered complete. For these reasons, it appears that these claims as written encompassed **New Matter**. Note that claim 14 is not included, as it specifically excludes what is considered New Matter.

Note that this **New Matter** issue could be removed & would be supported by the above cited support, particularly figure 5, by in **claim 1**, line 10, inserting after "therethrough," the limitation -- and then subjecting said coating to thermal processing; --, plus the leading the similar limitation that follows "substrate;", which would remove the above discussed ambiguity & require the sequence as illustrated in figure 5.

4. **Claims 1, 3, 8-10, 12, 14-18, 21-23, 25-28 & 47-49** are rejected under 35 U.S.C. **112, second** paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

See section 3 above, which discusses ambiguity with respect to timing of the claimed thermal processing & the formation of the hydrogen separation membrane. Also note that claim 14 is included in this rejection, because it ambiguously contradicts interpretations of independent claim 1. The examiner believes that the potential amendment suggested above by the examiner, would also correct the ambiguity for all claims listed here.

5. The following is a quotation of **35 U.S.C. 103(a)** which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The nonstatutory **double patenting rejection** is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. **Claims 1, 3, 8-10, 12, 14-18, 21-23, 25-31, 33-35, 37, 40-42, 45-46 & 47-49** are rejected under 35 U.S.C. **103(a)** as being unpatentable over **Ma et al.** (6,152,987), in view of **Hu** (2001/0016236 A1) , and further in view of **Dye et al** (6,214,090 B1) or **Peachey et al.**(5,738,708), optionally combined with **Yoshida et al**. (EP 1 208 904 A1).

In the 2/5/2011 after final submission, entered with the 3/14/2011 RCE, applicants have required the process employ a porous metallic substrate (was in now canceled dependent claims 4+11), although the examiner notes that this structure was already required in the all product claims. Applicants have also required that the process include thermal processing, however as noted above when this thermal processing is applied to the coating that has been formed on the substrate is ambiguous, and as presently claimed does not necessarily contribute to the formation of the hydrogen separation membrane, so cannot be considered to have any particular or necessary structural effect thereon. While the product claim does not have the problem of ambiguous phrasing as noted in the independent process claim, the mere addition of "and wherein said coating is subject to thermal processing" added to a product claim is a method limitation requiring no particular structure, especially considering that no particular thermal processing

techniques using any particular conditions, requiring to produce any particular effect(s) is(are) claimed; thus the limitation cannot be considered to necessitate or require any particular structure, let alone unobvious structure. In other words, while the claimed thermal processing (in either process or product), potentially could contribute to forming the hydrogen separation membrane & might potentially significantly contribute to its structure, as claimed it does not necessarily have any effect whatsoever on the structure, since thermal processing encompasses absolutely any exposure to any process that includes any temperatures above normal (i.e. room temperature). While discussion of thermal processing in applicants' specification, as in [0061], provides specific examples of procedures that may be employed, & [0060]+ figure 5 teach sequences with respect to other claimed process steps, neither these particular techniques, nor the particular sequences are required by the present independent claims' language, nor do the claims, as written, require any necessary results from subjecting the coating, which may or may not yet be part of the hydrogen separation membrane to generic thermal processing at some unspecific time after the formation of the coating. Given these considerations, and that both employing a porous metallic substrate & thermal processing were both separately considered in combination with independent claim limitations, the rejection over the above combination of references is being maintained.

Applicants previously (10/7/10) amended independent claim 1 to require limitations of laser direct writing on metallic ink compositions comprising Pd, Pd alloy or Pd + Ag alloy, surface treatment of the substrate via polishing, as well as additional limitations describing the effect of the required polishing to create smoothing of the original surface without changing the bulk properties of the substrate. Similarly, independent product claim 29 was amended to require analogous structural limitations, and it was previously noted that these limitations had been previously discussed when independent form, although not in combination with each other, which combination was further discussed below with relevant previous rejections.

Ma et al teach forming a hydrogen gas-extraction module that is selectively permeable to hydrogen; where the substrate may be a **porous metal** (stainless steel) tube, that is initially cleaned (a surface treatment), however there is also a discussion that the substrate may be heated to cause easily diffused elements, such as Al that are present in taught substrate (e.g. steel alloys) to diffuse to the surface of the steel substrate, where it can then be oxidized to form a diffusion resistant aluminum oxide coating. **Alternatively**, a metal to be oxidize can be deposited on the porous substrate, where that metal may be deposited by any conventional method, where suitable metals that easily oxidized in air are taught to **include Ta, Nb, V, & Al** (col. 3, line 21-col. 4, line 24, esp. col. 4, lines 1-24). The examiner notes that these are also substrate surface pretreatments; although Ma et al.'s heat diffusion technique is precluded by applicants' amended claims, since it changes the bulk properties of the substrate by diffusing the metal from the interior of the substrate to the surface, the alternative option of metal deposition is entirely consistent with techniques that *applicants' specification discloses as polishing*, i.e. the deposition of metals, although Ma et al. does not specify plasma deposition, CVD or PVD on the porous surface as disclosed in applicants' specification as providing a polishing effect, but one of ordinary skill in the art would readily recognize that Ma et al.'s teachings of employing "any conventional [metal deposition] method" (col.4, lines 16-17) would reasonably have been expected to include conventional PVD, CVD & plasma CVD, etc. techniques that are standardly employed for metal deposition, however these teachings in the primary reference are silent as to whether or not any smoothing effects would be present.. Further teachings with respect to Ma et al.'s intermediate coating techniques are found on col. 5, which while not discussing the suggested "conventional methods" of metal deposition, discusses oxidation, nitration or carbide formation on the surface, as well as additional protective layers such as alumina, silica, zirconia, titania, tantalum oxide, tungsten oxide, etc., applied by a suitable method (col. 5, line 46-50).

After such substrate preparation, **then** it is oxidized, nitrated or carbonized to form a barrier layer (intermediate layer 14, col. 3, line 46-col. 4, line 27). Thereafter, a membrane layer of Pd or Pd+Ag that

may be 18-32 µm thick, with preferred alloy ratios of 75-77% Pd and 23-25 % Ag, is deposited by the exemplary method of electroless plating, then the resultant membrane is typically rinsed in deionized water at 50-60°C (still reads on the broadest *generic, unspecified "thermal treatment" that has no* particular results, especially considering that washing or rinsing a resultant product after completion is a reasonable procedure to perform regardless of preceding deposition & film forming techniques). **Membrane deposition by other techniques**, such as vacuum sputtering or spray deposition, are also noted by Ma et al. as useful (col. 7, lines 21-26). Another embodiment separately plates Pd, then Ag, followed by forming the alloy membrane thereof at 300-1000°C in inert or H_2 atmosphere, thus a subsequent thermal treatment & an alternative reason for performing one, where the option of performing in inert atmosphere would have less than 10% by weight hydrogen as this amount includes zero (the H_2 atmosphere option does not provide a concentration, although it would've been obvious to one of ordinary skill in the art to optimize).

With respect to the product claims that require use of laser direct write or a metallic ink with metallic and carrier components, these are method limitations that do not provide any necessary structure to the product that is not already found in the structure of Ma et al's H-extraction modual, especially considering that the carrier in the ink, as read in light of the description is not intended to be a part of the resultant product. In Ma et al (987), see the abstract; figure 1; col. 1, lines 21-col. 7, line 40, esp. col. 1, lines 21-60; col. 2, lines 25-65; col. 5, lines 51-60+; and col. 7, lines 10-40.

While Ma et al. teach various possible intermediate layers on their porous metal substrate before deposition of their Pd or Pd+Ag layer, with mention of oxidation (e.g. oxidized by heating at 900°C in air metal oxide barrier layers; col. 5, lines 1-27, esp. 21-23) to form this layer that separates the porous support & membrane layer, where the overall structure is permeable to hydrogen. It is noted applicant's barrier layer is of undefined material, but now defined to allow hydrogen diffusion & prevent intermetallic constituents to defuse, where [0092] in applicants' specification attributes these abilities to

an oxidized metal surface, exemplary done at 900°C in air; therefore Ma et al.'s intermediate layer & applicant's barrier layer are considered functionally equivalent. However, Ma et al. do not discuss etching of the barrier layer before the Pd deposition, but the claimed etching of an unspecified material with specific agents, is fairly meaningless, especially when exactly what effect the etching is supposed to have on the unspecified materials is also absent. A process step that lacks the context in enabling one to determine its effect, cannot be considered to have any patentable significance. It has been noted, that after Ma et al. deposits an intermediate barrier layer from among their taught options (col. 5, lines 20-61), their exemplary Pd deposition sequence starts with immersing the substrate/intermediate layer in acidic $SnCl_2$ (e.g. a pretreatment before the Pd deposition & post-treatment after barrier layer deposition), thus indicating the desirability of coating pretreatments that have positive or desirable effects on subsequent membrane layer adhesion. Note with respect to generic etching, it may include cleaning of substrates, which cleaning one of ordinary skill in the art would find particularly obvious to employ, if any technique employed, movement or storage required between processing stages, or the like, provides any source or possible source of contamination to the substrate surface, where the choice of cleaning means would reasonably depend on the expected contaminant, and include acidic wash means.

Ma et al do not teach the use of a laser direct writing process, nor an ink composition, however they do teach that alternate membrane (Pd-Ag layer) deposition techniques may be used besides the exemplary electroless plating. **Hu** teaches a technique taught to be **advantageous over electroless plating** ([0009]), as well as to be useful for catalysis/separation applications or Pd-based membranes for H-permeability ([0010-11].), although does not provide a specific example of such use, but teach developing & implementing their techniques for specific embodiments would be a routine undertaking for those of ordinary skill in the art ([0018]). **Hu** teaches how to effect deposits having microporous, nanoporous or dense microstructures ([0026]). The Hu technique may pretreat a substrate (possibly porous metal) with a photocatalyst coating to be coated with a metal layer by reductive precipitation

([0027]), **then** with a solution containing metal precursors, for metals inclusive of Pt, Pd,... Ag,... ([0024], [0031], etc.), in carrier liquids including organic solvents or biological materials ([0024], [0030], etc.); **after** which heat may be applied to evaporate liquid ([0025]), and light that may be from a position-controlable **laser beam** to to provide precise deposition of metal particles &/or lines in essentially any desired pattern ([0029] & [0034]) he & to cause **reduction to metal**, so is inclusive of **laser writing processes**. In [0025], Hu's teachings suggest multiple applications of the precursor suspension may be applied. The structure of the film will be selected according to end use and may be porous to dense depending on biological/organic components present, where **sintering** may be employed to remove organic or biological components ([0026]), thus **suggesting further thermal treatment as claimed**. The technique may be used to make film from 1-5000 nm (i.e. .001-5μm). In **HU**, further see the abstract; [0005-7]; [0009-11]; [0016], [0018-19]; [0024-0026]; [0028-31]; and [0034-35].

It would have been obvious to one of ordinary skill in the art to apply the technique of **Hu** in the process of **Ma et al** for deposition of the Pd-Ag coating, because the primary reference suggests that alternate deposition techniques are applicable, where Hu provides motivation for use of their technique specifically due to their suggested enduses that explicitly include hydrogen separation membranes, such as Pd-based membranes as desired by Ma et al., plus Hu teaches that their procedure is advantageous over electroless plating, which is the exemplary technique used by Ma et al., thus providing a reasonable expectation of superior results by employing deposition of a photoreducible liquid composition as taught by Hu & may be considered to read on an ink, especially considering teachings of Hu concerning the precise deposition control & ability to produce any desired pattern via this technique.

Ma et al do not teach a step that is called a "**polishing**" step of an ion beam treatment or vapor deposition before depositing their metal chalcogenide (oxide barrier coat), but as noted above they do teach the option of conventional deposition of metal (e.g. Ta, Nb, V, Al, or other easily oxidized metals) in preparation for oxidizing the surface to form a metal oxide barrier layer, but without explicit mention

of the deposition process employing vapor techniques or affecting surface smoothness. However, **Dye et al** or **Peachey et al**, who are also teaching formation of **analogous membranes**, teach ion milling as a cleaning that may be used **in conjunction with** washing pretreatment before coating the core substrate with a catalytic metal, such as Pt or Pd, etc, possibly by vapor deposition techniques, onto the metal core that is not porous, but passes hydrogen. Additionally, an intermediate buffer layer may be employed between the central metal & the catalytic metal, inclusive of **metal oxide**, such as alumina, tungsten oxide, or other oxide like silica, etc., so as to reduce interdiffusion between catalytic metal & central metal, where the buffer layers are also preferably deposited in the same manner as catalytic metal, i.e. under vacuum using vapor deposition techniques, where the teaching of the same manner which suggest inclusion of the same cleaning techniques. Either the ion milling or the vapor deposition metal step may read on the claimed 'polishing' due to expected effects and context, as well as what polishing encompasses in the scope of the claims as read in light of applicant specification. In DYE et al, see the abstract; col. 1, lines 10-17 and 36-col. 2, line 45; col. 3, line 11- col. 4, line 55. In PEACHEY et al, see the abstract; col. 2, line 36-col. 4, line 15, esp. col. 2, lines 51-57 & col. 3, lines 51-66. It is noted that it is not necessary for a reference to use identical language to produce the same effects, thus the references need not use the word "polishing" in order to affect the equivalent of polishing, as discussed above.

It would have been obvious for one of ordinary skill in the art to apply metal layers to the porous cylindrical substrates of Ma et al., as suggested therein as preparation for formation of oxide barrier layers, by employing techniques as used by Dye et al or Peachey et al, because the ion treatment technique is a cleaning technique taught to be desirable combined with Ma et al's suggested cleaning; and furthermore is used preceding various taught vapor deposition coevaporation, ebeam evaporation, sputtering, ion beam assisted sputtering, etc., which are demonstrated to be a conventional techniques for depositing metals (or metal oxides), such that it would have been reasonable for one of ordinary skill of the art to employ the additional cleaning techniques demonstrated for analogous purposes & analogous

materials, as well as employing Dye et al or Peachey et al's suggested deposition techniques that would reasonably be considered to read on the suggested conventional deposition techniques of the primary reference, especially considering the desirability of employing both techniques together as preparation for the oxidation treatment of Ma et al due to their expected effectiveness so employed on analogous substrates for analogous sequences of coating materials. Note both Ma et al. & Dye et al or Peachey et al are concerned with desirable for their techniques effects on catalytic metal layer deposits, and for the **overall composite with the barrier layer for effecting reducing poisoning of the membrane**. It is further note that the ion beam milling is preformed in the same chamber as the vacuum depositions of catalytic and oxide layers that as its name suggest, it causes removal of surface material, i.e. **etching**, and is old and well known for a technique to **improve adhesion**, hence would have been analogously obvious used between coating steps for similar surface activation effects. **Peachey et al** is noted to further use ion-assisted vapor deposition techniques for both catalytic metal and oxide buffer layer, and it was known in the art that such techniques may employ an ion beam simultaneously with vapor deposition, which sputters or etches materials simultaneously with deposition.

It is further noted that while this combination does not use the term "polished", as discussed above, it would reasonably have been expected to provide the results that may be termed "polished" in light of applicants' specification that indicate such metal vapor deposition techniques as are suggested by the above combination, would be considered to produce a smooth or polished affect on the surface, especially lacking any more detailed or specific requirements that provide any critical differences in the generic treatment technique that might possibly provide any differentiation. Claiming essentially the same process by describing the results, rather than the means for producing results does not provide a significant distinction over the art.

Optionally, one of ordinary skill in the art would reasonably further consider the teachings of **Yoshida et al**. ((EP): abstract; [0001-2+]; [0006-17]), who are also forming hydrogen separation

membranes employing porous substrates that may be metal, but included teachings with respect to the types of surface roughness desirable in the base material & teach steps of polishing the surface of the base material in order to provide desirable surface structure. Thus, it would've been obvious to one of ordinary skill in the art that given analogous structures & like enduses, to consider the teachings of desirable & effective relative roughnesses & polished surfaces of porous substrates, as discussed by Yoshida et al. & optimize the above combination in order to provide surfaces having desirable demonstrated & texture, noting that if the above combination already provides or has the capability of providing taught desirable surface textures, determining this would have been within reasonable bounds of optimization & routine experimentation.

7. **Claims 29, 33-35, 37-38, 40-42, 45-46 & 49** are rejected on the ground of nonstatutory **obviousness-type double patenting** as being unpatentable over claims 1-15 of U.S. Patent No. **7,560,170 B2** (Chellappa), in view of **Ma et al.** (6,152,987), and optionally further in view of **Hu** (2001/0016236 A1), both discussed above.

The copending **patent (170)** claims are directed to products inclusive of hydrogen separation membranes, which have the structure of a porous metal substrate, which has been treated to decrease its surfaces' "initial variance", without substantially altering the bulk porosity of the metal substrate, which decrease of the initial variance is achieved via deposition of a coating. In order to form the hydrogen separation membranes a membrane material is deposited thereon, which may be palladium. While the discussion of decreasing variance in copending (170) patent claims uses different semantics than the presently claimed "polishing" of the present application, both sets of claims are directed to smoothing surfaces microstructure, hence are considered to be directed to overlapping scopes that are obvious variations on the same concept.

The copending patent (170) claims also differ by not requiring particular structures, such as the substrate being cylindrically shaped, or employing a diffusion barrier, and do not discuss particular

thicknesses for their membrane, as well as not reciting the same method limitations in the product claim as the present application, however as can be seen from the teachings of **Ma et al.**, hydrogen separation membranes conventionally employ cylindrical shapes & layers to prevent diffusion from the substrate to the catalytic membrane, which read on the presently claimed diffusion barrier, as well as employing thicknesses overlapping with those presently claimed, thus it would've been obvious to one of ordinary skill in the art to employ the teachings of Ma et al. when determining overall structures useful for employing the specific product features of the (170) claims, as Ma et al. demonstrates the conventionality of such structures for the same enduses. With respect to the claimed method limitations in the product claims, they do not define any necessary structural difference from the structure suggested by the combination of Ma et al. & the (170) claims, or optionally, the teachings of **Hu**, as discussed above in combination with Ma et al. in section 6, demonstrate the obviousness of techniques such as laser writing using metallic solutions that may be called metallic inks, for deposition like metal coatings that may also be employed for hydrogen separation membranes, thus further showing the obviousness of the structure, as well as the capability of depositing that structure via the particular techniques.

The addition of "subjecting the coating to thermal processing" adds no necessary structure that can be determined by the examiner to the product claims, thus is not considered to make any patentable distinction with respect to copending patent (170). Additionally as noted above, Hu shows that it is known in the art that when employing a solution deposition, followed by laser photoreduction, subsequent heating via sintering may be employed, such that the techniques are known to be used in the claimed combination with suggestions for use in making analogous membrane structures.

8. **Claims 1, 3, 8-10, 12, 14-18, 21-23, 25-29, 33-35, 37-38, 40-42, & 45-49** are rejected on the ground of nonstatutory **obviousness-type double patenting** as being unpatentable over claims 1-27 of U.S. Patent No. **7,077,889 B2** (Chellappa et al.), in view of **Ma et al.** (6,152,987), and further in view of **Hu** (2001/0016236 A1).

The copending **patent (889)** claims are directed to products & processes for forming **hydrogen separation membranes**, which have the structure of a **porous metal substrate**, which has been treated on the surface by ion beam exposure to decrease its surfaces **initial** "**variance**", where a membrane containing lease some **palladium** is deposited on this treated printable surface. While the discussion of decreasing variance in copending (889) patent claims uses different semantics than the presently claimed "polishing" of the present application, both sets of claims are directed to smoothing surfaces microstructure, hence are considered to be directed to overlapping scopes that are obvious variations on the same concept.

The copending patent (889) claims also differ by not requiring particular structures, such as the substrate being cylindrically shaped, or employing a diffusion barrier, and do not discuss particular thicknesses for their membrane, as well as not reciting the same method limitations in the product claim as the present application, nor do the method claims of (889) required the presently claimed laser direct writing process & the composition deposited for this treatment, however as can be seen from the teachings of **Ma et al**., hydrogen separation membranes conventionally employ cylindrical shapes & layers to prevent diffusion from the substrate to the catalytic membrane, which read on the presently claimed diffusion barrier, as well as employing thicknesses overlapping with those presently claimed, thus it would've been obvious to one of ordinary skill in the art to employ the teachings of Ma et al. when determining overall structures useful for employing the specific product features of the (889) claims, as Ma et al. demonstrates the conventionality of such structures for the same enduses. With respect to the claimed method limitations in the product claims, they do not define any necessary structural difference from the structure suggested by the combination of Ma et al. & the (889) claims. Alternatively, the obviousness of the (889) products may be further considered, along with the obviousness of particular palladium membrane deposition techniques, when considering the teachings of **Hu**, as discussed above in combination with Ma et al., as set forth in section 6, which demonstrate the obviousness of techniques

such as laser writing using metallic solutions that may be called metallic inks, for deposition like metal coatings that may also be employed for hydrogen separation membranes, thus further showing the obviousness of the structure, as well as the capability of depositing that structure via the particular techniques.

9. **Other art** of interest previously cited included: **BOSSARD et al** (2004/0244589 A1), while published on 09/12/04 is noted to have a provisional parent with filing date of 6/4/2003, so as a potential 103(e) reference, especially relevant to claims 1, 3 and 5, 7, 13-18, 29-31, 36-47 & 49, but is presently redundant in view of the above rejections. Particularly, see the abstract; figures, esp. 5-9; [0018-19]; [0041-51]; [0060-71], esp. [0063], [0066], [0068].

ALLEN et al (6,077,621) is noted to have teaching is equivalent to dye et al. & peachy et al., as discussed above in section 8. Particularly, see the abstract; col. 1, lines 10-20; col. 3-5.

With respect to the 6/24/2010 **IDS**, it is noted that **Dye et al**. (WO 00/78434 A1) is the child of **Dye et al**. (090) applied above;while the Japanese abstract of Shigamura et al. indicates use of laser heating, but to plasma sprayed, not solution or ink applied material.

Also of interest to the state-of-the-art is **Chellappa** (7,220,699 B2) by one of the present inventors & directed to overlapping subject material, but overall different methods & products.

10. Applicant's arguments filed 12/31/10+ 2/5/11, entered with the 3/14/11 RCE & discussed above have been fully considered but they are not persuasive.

The examiner does not agree what applicant's apparent belief that "a position-controllable laser beam could be used to provide precise deposition of metal particles &/or lines in essentially any desired pattern" ([0034], etc.), when applied to the metal complexes in solution of Hu is not direct-writing with a laser, as it essentially provides the equivalent of a definition of direct write laser patterning. That the semantics are different, i.e. the precise same words are not employed, it does not make for patentable significance. That Hu's teachings may also employ laser treatment options that are not laser direct writing,

such as other conventional photolithographic techniques, does not negate the teachings of employing position controllable laser beams for precise deposition of lines, etc.

11. **Any inquiry** concerning this communication or earlier communications from the examiner should be directed to **Marianne L. Padgett** whose telephone number is **(571) 272-1425**. The examiner can normally be reached on M-F from about 9:00 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks, can be reached at (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marianne L. Padgett/
Primary Examiner, Art Unit 1715

MLP/dictation software

3/17/2011